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AND

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" ..... per litora spargite muscum,
Naiades, et circùm vitreos considite fontes :
Pollice virgineo teneros hìc carpite flores :
Floribus et pictum, divæ, replete canistrum.
At vos, o Nymphæ Craterides, ite sub undas ;
Ite, recurvato variata corallia trunco
Vellite muscosis e rupibus, et mihi conchas
Ferte, Deæ pelagi, et pingui conchylia succo."
Parthenii Ecl. 1.

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I.—*Notice of the Life and Labours of* DeCandolle : *extracted [and translated] from the Address delivered before the Royal Botanical Society of Ratisbon, at its meeting on the 28th of November* 1841, *by the President* Prof. von Martius*.

Augustin Pyramus DeCandolle, Professor of Botany at Geneva, died on the 9th of September 1841. DeCandolle exerted such an extensive and powerful influence upon the progress of botany, that he is identified with the history of the science in the present century.

The man who impressed the seal of his genius on the natural history, and especially on the botany of the last century, Linnæus, died at Upsal on the 10th of January 1778. On the 4th of February of that same year, twenty-five days after the departure of Linnæus, and on the same day upon which the death of Conrad Celtis occurred, Aug. Pyramus DeCandolle saw the light of day at Geneva. Thus did the spirit of the times, which guides the wisdom of man, transfer the *rôle* of the systematical classifier of plants from Sweden to the verdant shores of the Leman, and place it in the cradle of him, upon whose urn we now suspend the flower-garland of grateful reverence.

"Scilicet a tumulis, et qui periere propinquis,
Protinus ad vivos ora referre juvat."
Ovid, Fast. II.

* We give this memoir as it has appeared in Silliman's Journal for last April, not doubting that it will greatly interest our readers. The initials affixed we conclude to be those of Dr. Asa Gray.—Ed. *Ann. Nat. Hist.*

DeCandolle was without doubt the Linnæus of our age. In the right understanding of what he has accomplished, lies the true measure both of his own greatness and of the work done by his predecessor,—lies the sum of the progress which botany has made since the departure of Linnæus from the scene of his activity. The importance of systematic arrangement and classification was the leading idea in both their minds; and consequently both have been especially useful as *registrators* of the vegetable kingdom. Both, however, were influenced and guided by the ideas of vegetable physiology and morphology which each had formed. The systematic works of both, therefore, went hand in hand with their general views, received from them their impulse and signification, and reflected back the spirit which distinguishes their different epochs. They are accordingly as different in their manner of comprehending and of carrying out their ideas, as were the fundamental principles respecting the nature of plants which prevailed in the time of each. There is, however, this essential difference between them. The thoughts which Linnæus embodied in his system were his own creation. DeCandolle, on the other hand, adopted the ideas of the French school, founded on the natural method of A. L. de Jussieu, with the view to their full development in an universal descriptive system of the vegetable kingdom. We do not at present propose fully to trace the parallel between Linnæus and DeCandolle, although some of its elements will be indicated in the brief sketch of the life and labours of our much-lamented friend: but it remains for the historian of botany to exhibit in detail the relations which these two men sustained to each other, and to the epochs in the progress of the science distinguished by their names.

Aug. Pyr. DeCandolle sprung from a noble family of Provence, which, from religious considerations, removed to Geneva in the year 1558. The younger Catholic branch of the family, still existing in Provence, is now represented by the Marquis DeCandolle, with whom the Genevan botanist always maintained the friendly relations of kindred. Augustin DeCandolle, the father of our departed friend, was one of the first magistrates (premier syndic) of the republic of Geneva. In the early years of his life, the feeble health of the child gave much anxiety to his parents. In his seventh year he suffered from an attack of acute hydrocephalus; but fortunately conquered a disease so often fatal to childhood, or which in other cases so frequently leaves behind a feebleness of the mental powers. But the youth and man, with his well-organized head, fitted for the most difficult processes of thought, experienced no further ill effects from this distressing malady.

In the gymnasium (*collège*) he was not distinguished, except

for his proficiency in Latin and French versification. By the time he reached the first class, in the year 1791, he had gained many prizes by his great facility in versification and his uncommonly retentive memory. At this period, when his body and mind were proportionally and very rapidly developed, he entered into the "belles-lettres class," a division which answers to the German *lycealcursus*, or highest department of the gymnasium. The Revolution about this time (1792) overflowing the limits of France, extended itself into Switzerland; the government of the canton of Geneva was overthrown; and the father of our DeCandolle retired to an estate which he possessed in Champagne, a village near Grandson, between Yverdun and Neuchâtel. The young man had until now devoted himself almost exclusively to classical studies. He had read the great Latin and Greek authors diligently, and with good effect on the development of his judgement; he had written many essays in French and Latin verse, and knew by heart a great number of classical passages from the literature of these languages. Even at the time of his leaving college, his memory retained so perfectly the first six books of the Æneid, that he could go on with the recitation of any portion of them taken at random without hesitation. The study of history was peculiarly attractive to him, and for a long time he regarded himself as destined to the profession of an historian.

Somewhat later he attended to the lectures of Pierre Prevost on philosophy. Logic from the lips of this celebrated natural philosopher, the author of the valuable treatise on the equilibrium of caloric, had a powerful influence on his excitable mind. It gave him the habit of acute and clear thinking, and was an excellent introduction to the different exact sciences, with the study of which he was employed in the years 1794 and 1795. Physics, the department of Marc. Aug. Pictet, had more attraction for him than mathematics.

Meanwhile his residence in the country, where he was accustomed to pass his vacations, had brought him nearer to nature. Without any book on botany, following the guidance simply of the objects themselves, he accustomed himself to the art of observation. At first this occupation had only the character of a pastime or recreation. What afterwards suddenly induced him to devote himself wholly to the "amabilis scientia," was the excitement which he experienced in 1796 in the lecture-room of the excellent Vaucher*.

The number of teachers at the Academy of Geneva was at that

* [The teacher survived for about a year his more celebrated pupil An interesting biographical notice of M. Vaucher, from the pen of Alphonse DeCandolle, has recently been published in the 'Bibliothèque Universelle' at Geneva, an English translation of which appeared in the 'Annals and Magazine of Natural History' for November and December last.—A. G.]

time very small. M. P. Vaucher, professor of theology, who soon after proved himself an accurate observer by his account of the Confervæ of fresh water, was giving in that year a free course on botany. DeCandolle had only heard the first half of the course, when he returned to his parents at Champagne, determined to devote himself exclusively to this science. The attractive descriptions of Vaucher had revealed to him his own genius; and he chose at the age of eighteen the vocation to which he remained faithful during his whole life, with an enthusiasm which did not desert the man of sixty-three even on his death-bed. In these lectures he had become acquainted with the organs of plants. Returning to the country, he began at once to describe the plants which he found, indicating them by their common, not their scientific names, of which he was at that time ignorant. He considered himself fortunate a few months afterwards, when he received the first edition of Lamarck's 'Flore Française' and a few other botanical books, whose true value he immediately understood.

It was the custom at that time, in his native city, for the sons of rich parents to study law. DeCandolle consequently began this study in the year 1796, but with the fixed intention of not allowing it to affect his future destination. One of his friends, who was closely connected with Dolomieu, induced him to pass the winters of 1796 and 1797 in Paris, under the eye of that celebrated observer of nature. He received his father's permission for this and lived in the house of Dolomieu, by whom he was treated with paternal tenderness. He now attended the lectures of Vauquelin, Fourcroy, Charles, Portal and Cuvier. In the Jardin des Plantes he had made the acquaintance of Lamarck, Deleuze and Desfontaines. To the latter his heart was peculiarly drawn. The gentle repose of this learned and amiable man enchained him as to a second father*, and he preserved to his latest breath the most tender and grateful affection as well for him as for Vaucher. These winter sessions had opened to him a view into the depth and extent of natural science. He perceived the importance of the relations between physics, chemistry and botany; he perceived that the latter science had reached a station where she required especially for her completion the aid of the others. He determined to labour in this field, and to help to bring botany out of her isolated position. This was besides the peculiar task of the period. The labours of our great M. von Humboldt, of Priestley, of Ingenhauss, &c. had extended the domain of botany in a similar direction. Accordingly he came out first with

* DeCandolle honoured the memory of his friend, who died on the 16th of November 1833, by a "Notice Historique sur la Vie et les Travaux de M. Desfontaines," in the 'Bibliothèque Univers.' Feb. 1834.

his treatise upon the nourishment of Lichens, which, in the summer of 1797, was laid before the Société de Physique et d'Histoire Naturelle, then recently established by Saussure at Geneva. His intercourse with Senebier and Vaucher confirmed him in this direction of his faculties. It is easy to perceive, that, in the whole course of his literary labours, he sought to make the doctrines of physics and of chemistry available in their application to botany. We find the same spirit in his excellent treatise 'Sur les Propriétés Médicales des Plantes' (Paris, 1804, 4to), of which Perleb has given a German version (1810) enriched with many valuable additions. He attempted in this work to represent more fully than had been before done, the parallel suggested by Linnæus, but opposed by other writers, between the outward forms of plants and their chemical constitution and adaptation to pharmacy; a labour in which he manifested a happy talent for tracing back various phænomena to their origin in general principles.

In the year 1798 Geneva was incorporated into the French republic. DeCandolle, finding his future prospects much affected by this event, the property of his parents having been materially diminished by the catastrophes of the Revolution, determined to adopt the medical profession, and easily obtained the consent of his father, who hoped that he would be thus established in a lucrative mode of life. The son, meanwhile, whose enthusiasm for botany had increased from year to year, thought principally of the greater facilities he should thus enjoy for the pursuit of his favourite science. During this year he went the second time to Paris; and taking up his abode in the neighbourhood of the Jardin des Plantes, he gave himself up with zeal to the study of its accumulated treasures. Lamarck encouraged him to labour with him in the botanical portion of the 'Encyclopédie Méthodique,' in which he wrote the articles *Parthenium* and *Lepidium*. He also assisted Lamarck in the preparation of the article on *Panicum*, Poiret in that on *Paspalum*, described the species of *Senebiera*, and published his treatise on Lichens. At the request of Desfontaines he undertook the preparation of the text for the 'Plantes Grasses,' which Redouté had begun to represent in a splendid iconographical work. He received on this occasion the most friendly assistance from Desfontaines and L'Héritier, who gave him the free use of their rich collections and invaluable books. If neither this work, nor that on the *Liliaceæ*, which Redouté published somewhat later (also with the assistance of DeCandolle), nor the *Astragalogia* published in 1802, merit the praise of exact analytical descriptions of individuals, such as science now demands of *monography*, yet they already foreshow the facility and acuteness of systematic comprehension which so fully characterize DeCandolle's later efforts.

At this period he contracted a close friendship with the noble-minded Benjamin De Lessert, a man always open to everything great and useful. The two friends glowed with the purest enthusiasm for the benefit of their fellow-men. They founded the Société Philanthropique, whose first operation, during a time of public necessity, was the distribution in Paris of the Rumford soup. DeCandolle was during ten years the secretary and an active member of that benevolent society. At this time he brought to maturity another institution of a similar tendency, which is still flourishing, viz. the Société d'Encouragement pour l'Industrie Nationale; he drew up the statutes for this society, and assisted until the year 1807 in preparing the bulletins issued by it. His activity in this field of philanthropy was maintained and enlarged by his intercourse with many distinguished men of similar views, such as the geometrician Lacroix, Biot, Cuvier and the elder Brongniart. About this time he received the visit of two of the most distinguished citizens of the department of the Leman, who requested him to join them, in order to represent the interests of the department in a union of his *Notables*, which the First Consul had summoned. He accompanied them to the Tuilleries. Bonaparte inquired for the representative from Geneva, and turning to DeCandolle endeavoured to obtain from him the declaration that Geneva found herself happy in her union with the French republic. But courtesy could not bring the son of the Genevan magistrate, an upright friend to his country, to make an obsequious reply.

In the year 1802 DeCandolle married Mademoiselle Torras, the daughter of a Genevan then resident in Paris. This marriage, founded on mutual affection, and made happy by love and harmony, gave him three children; of whom only one son survived the father. In the same year he was called to be *professor honorarius* in the Academy at Geneva, but did not yet engage in its duties. He remained in Paris instead, and gave at the Collège de France, in Cuvier's place, his first course on botany.

Benjamin De Lessert had purchased, in the year 1801, the rich and very interesting herbarium of the Burmann family. The duplicates he presented to his friend DeCandolle; and the latter afterwards acquired the equally rich collection of plants made by L'Héritier, who had fallen a victim to assassination. These were the foundation of the immense herbarium which DeCandolle increased, during his active life, to the number of from seventy to eighty thousand kinds, and which may be regarded not less for its copiousness than on account of its exemplary order, and the rich variety of original specimens communicated by all the distinguished botanists of our times, as one of the greatest treasures in natural science of all Europe.

At the same time DeCandolle began the preparation of his 'Flore Française'; which, although announced as a second edition of the work by Lamarck under the same title, should be regarded as exclusively the production of DeCandolle, since Lamarck gave to it only his name and the use of his collections. Many years were employed in the collection of materials for this work in all the provinces of France. The author had opened a correspondence with all the botanists of the country, especially with Nestler, Broussonet and Balbis, as well as with many foreign students of nature,—with Vahl, Pallas, Willdenow, Jacquin, the younger Hedwig and others, and made repeated journeys throughout France. This work, a truly great one, embracing a region rich in plants, was the first flora arranged according to the principles of the 'Méthode Naturelle.' The introduction to it, which exhibits a clear and orderly conception of nature, was DeCandolle's first attempt to give a scientific representation of this theory. It met, as well as the annexed 'Clavis Analytica,' with the greatest approbation. The work, the sale of which in the year 1804 had already reached to four thousand copies, is now quite out of print. It is the first book which has appeared in France in which we Germans find a satisfactory account of Cryptogamous plants resting on actual personal examination, a class of plants which had been before much neglected in France. The masterly manner in which an immense mass of materials has been treated,—the exactness with which the descriptions are given in a luminously technical style, whilst at the same time more is said of the geographical situations of plants than has been usually the case,—stamp this 'Flore Française' as a work of great merit. With this alone would DeCandolle have fulfilled his obligations to the public, had he written absolutely nothing else. So thorough a production could not but meet with acknowledgement by the French government. Such men as Chaptal and Lacepède knew how great an influence on the national welfare a thorough knowledge of the vegetation of the country would exert. He received accordingly a commission in 1806 to travel through France and the kingdom of Italy, and to study these countries in a botanical and agronomical point of view. For six years he made a journey each summer, and gave an account of his observations to the Minister of the Interior. In these official reports he described the peculiarities of the district of country, noted the modes of culture in use, and presented plans for their improvement. He neglected no occasion to bring forward unobserved truths. His noble independence of character often led him to protest against faults in government, on which occasions he did not limit himself to his immediate commission. Some of these official reports have appeared

from the press. He had at the same time formed a plan of preparing an extensive statistical work upon the condition of farming and of everything connected with it, which he would probably have completed, accustomed as he was to give to his plans the fullest development, if the political catastrophe of 1814 had not directed his activity into new channels. Only a few portions of that work were completed by him. One result of these journeys was the very valuable supplement, in a botanical point of view, to his 'Flore Française.' Meanwhile he had been called, in the year 1807, to the professorship of the medical faculty at Montpelier. He repaired thither a few years later (1810) to take possession of the professorship of botany in the philosophical faculty (*faculté des sciences*) which was then created. He received the direction of the botanical garden, the collections of which he soon doubled. His active spirit animated the scholars, who flocked thither in great numbers. Since Magnol, the chair of botany at Montpelier had never exercised so favourable an influence on the academic youth. The clearness, fullness and elegance of his style, the practical bearing which he gave to his teachings, with the genial serenity and freshness of his character, which united the glow of the Provençals with the serious diligence of the Swiss,—who could withstand such qualities? His ready talent for extemporaneous discourse, and the spirit and grace which he threw into his lectures, made his science charming even to women. Even if what passes by the name of botany among the fair sex in France and Switzerland be not precisely *his science*, yet it may be deemed a proof of his influence, that in those countries a knowledge of plants is regarded as almost as essential an element in the education of women as that of music with us sound-loving Germans.

One result of his academical labours at Montpelier, of great interest for the scientific public, was the publication of his 'Théorie Elémentaire de Botanique'; the first edition of which appeared in 1813, the second in 1816. This book put into circulation a host of new and sound ideas in vegetable morphology and physiology. His talent for generalization is manifest throughout this work, often leading him, indeed, into by-ways, which however, like every excursion of the true inquirer, tend to bring him ultimately to a higher point of view. Two doctrines, here for the first time propounded in a scientific connexion, that of the confluence or union of organs (*soudures*), and that of their unequal development or suppression (*avortemens*), have become, under certain points of view, canons in observation. It may be said in general of the theoretical views of DeCandolle, that they differ in many respects from those of Linnæus, and often justly supersede them, because they are founded on broader and more physiological premises. I

do not stop to point out these differences. It would be necessary to enter deeply into their respective modes of thinking, to do justice to either of these eminent inquirers into nature.

DeCandolle's views approach more nearly, on the whole, to those of Gœthe; but it is not to be thence inferred that he was essentially aided by our great poet in the development of his ideas. Even in Germany, it was long before we understood Gœthe's object in his doctrine of metamorphosis. But when DeCandolle was informed of the powerful impression which these views had made on our minds in Germany, he caused Gœthe's book to be translated and studied it diligently. In his later and larger work ('Organographie Végétale,' 1832, translated into German and enriched with valuable notes by Meisner and Rœper,) may be found echos of Gœthe's theory, and evidences of a further progress in that direction. It is not possible, however, definitely to assign to each individual his own property in truths which spread with rapidity and force among thinking men. They do not originate from one head, they belong to the *time*, which excites them in many minds and enunciates them in various forms. In this view, nothing seems in more wretched taste than contention about the priority of a theoretical idea. The students of nature freely acknowledge that they derive their ideas from the objects of their examination, not from themselves; they announce them with so much the more confidence in proportion as they recognise in them only the words of nature, which they have become worthy to hear.

The fall of Napoleon restored to our friend his political independence. He had returned to Geneva in the year 1814, to visit his friends. The contemplation of the prosperity which the republic enjoyed on its separation from France, the associations of childhood, the patriotic pulsations of his heart, all drew him back again to his home. The political commotions in the south of France, at that period, were not adapted to render his residence there agreeable. Called during the Hundred days to be Rector of the University of Montpelier, he had to struggle with a host of difficulties, especially as the return of the Bourbons produced a dangerous reaction against those who had served under the Emperor, and especially against Protestant families. Although no partisan, yet DeCandolle was obnoxious in both points of view. His own country presented (under less brilliant auspices to be sure than in Montpelier) the attractions of the father-land, the satisfaction of labouring for his countrymen, repose from political convulsions, and with all these sources of enjoyment, a society such as Geneva alone, situated as it is on the highway of the world, can collect together.

The State Council of Geneva created for him a professorship of

natural history, and he returned, on the 8th of November 1816, into the service of his native country. The French government did not part with him willingly; his scholars at Montpelier made every possible effort to retain their beloved teacher, but in vain. In Geneva he had lectures to deliver in zoology as well as botany. In this field likewise he manifested his happy talent for instruction, and all his lectures were enthusiastically received by a crowd of hearers.

At the instigation of DeCandolle a botanical garden was instituted, of which he was the curator until his death. More than 500 subscribers formed by degrees a fund of 89,000 francs, appropriated to the support of this garden. This is not the only testimony of the sympathy of his fellow-citizens in what DeCandolle recommended as for the interest of science and of the town. There was accidentally entrusted to him for a short time a large and valuable collection of drawings of Mexican plants, made by the Spanish botanists Leon Moçino and Cervantes, in Mexico. These being unexpectedly called for, all the artists and amateurs of the city assembled at his request, and in eight days' active labour made a complete copy of all these drawings. DeCandolle told me with glistening eyes, that this proof of the regard and affection of his fellow-citizens was one of the most delightful experiences of his life. But who among his associates would not gladly have assisted in scientific efforts a man who was distinguished by so much gracefulness, by such transparent frankness, united with such fine tact in social intercourse? He was a keen observer, an accurate judge of the human heart. It was therefore easy for him to associate with all classes in society, and to influence all for the good of the commonwealth. This is manifest by his being chosen in the year 1816 into the Council of the representatives of the canton, and being twice unanimously re-elected after the first time of service, in the years 1829 and 1839, by the voice of the people. As long as he lived in his paternal city, he was called by the confidence of his fellow-citizens to situations of public responsibility. He examined with a penetrating glance the condition of municipal affairs at that time; a friend of order and of a peaceful progress, he set on foot many useful institutions, and applied himself to the carrying out of others which were projected by congenial patriots. He took an active part in the formation and enriching of the museum of the Academy; I have already mentioned that the botanical garden was created by him. As president of the Society of Arts, he animated every movement of his fellow-citizens in the field of arts and manufactures. He considered attention to agriculture of peculiar importance in a small republic which depends upon its neighbourhood for the necessaries of life. On this account he founded in that society a peculiar class for

agriculture, whose labours he promoted with the most lively interest. To impress the agriculturist with the importance of his calling, to awaken in him the spirit of emulation, of observation of nature and of careful reflection, he regarded as one of his most pleasing duties, both as a citizen and as a man of learning.

His imagination was lively and excitable, if not creative; his feeling for beauty was pure and unprejudiced: he could not therefore be other than a warm friend of the fine arts, and he accomplished for their support in his canton whatever lay in his power. Yet he did not carry his love for the fine arts to excess, but always regarded them merely as means for the embellishment of life: not so the attainment of objects of real utility; these lay nearer to his practical understanding, to his spirit of republican citizenship. On this account the Class of Industry in the Société des Arts had reason to rejoice in his peculiar co-operation. The report of 200 pages which DeCandolle prepared in the year 1828, for the Industrial Association of Geneva, is a valuable testimony to his varied knowledge, and his devotion to the manufacturing interests of his country.

The institution of the council of the museum, the improvement of the schools through the extension of special instruction, the enlargement of the public library, the direction of schools for the people, the definitive organization of an institution for the deaf and dumb, his contributions for the erection of a small post for the use of the rural communities, and also for the founding of a better system for the instruction and examination of medical and surgical students—all these actions of an elevated patriotism either originated with him, or received his earnest and effectual support. It must be particularly mentioned in this place, that he exercised the most beneficial influence on all the departments of public instruction by his counsel, by his powerful aid, and by the authority of his name.

It was his constant effort to increase the desire for knowledge, —to extend the circle of science. He was inspired by that genuine aristocracy, which we find also in a Cuvier, a Fourcroy and a Laplace; he wished to raise science to the rank of a princess, that she might make herself the servant of mankind. In this sense also he was a great friend to publicity; he helped to introduce it into his country; he caused it to be prized at a period when it had not yet been regarded with favour, and in which it not seldom called forth suspicion and alarm.

In his place as member of the representative council, subjects of great political importance were often referred to him. He discharged all such commissions with as much skill as independent disinterestedness. More than thirty commissions of this kind were executed by him with as much assiduity as if they concerned ob-

jects of his own favourite science. His friend, the first Syndicus, Rigaud, who honoured his memory by a discourse on occasion of the induction of the lately elected deputies, mentioned two such labours; one relating to a project for a committee for procuring provisions for the city (*comité des subsistances*) of the year 1820, and another two years later, on the project for reprisals against France in relation to their exports and imports, which had for its object the rejection of the project. Mr. Rigaud remarks on this subject, "The first report was an excellent work, which touched on the most important questions of national œconomy. It introduced also just ideas on the question of provision for the people by other means than by the government, at a period when the remembrance of a recent time of scarcity had fixed many prejudices even in the minds of enlightened men. DeCandolle exerted himself to present the doctrines of political œconomy in an intelligible manner, just as he tried to clothe every other species of knowledge in a popular dress. As early as the year 1817 he had published a treatise for the instruction of the public, on occasion of a disturbance among the people arising from the dearness of potatoes. In his report upon the project of introducing restrictions on the trade with France by way of retaliation, he developed the principles of true freedom of trade in his peculiarly lucid manner. His influence in the representative council was great. It was grounded on a high opinion of his character, as well as of his extraordinary talents, and on an eloquence which expressed his inward convictions with the fire of sudden inspiration. As a citizen and member of the council, DeCandolle pursued steadily but one object; that of bringing opinions into harmony,—of always drawing more closely the bonds of unity among the citizens of Geneva. He exerted himself to convince his numerous friends, often of different political parties, that extreme opinions could not find room in a small republic, and that reciprocal sacrifices were often required for the good of the country."

It may perhaps, gentlemen, appear at first sight irrelevant to the present occasion, to enter so much into detail respecting DeCandolle's influence as a citizen and magistrate; yet I find myself called upon to do so on many accounts. In the first place, we thus learn to appreciate the whole power of a mind, which could combine with an almost inconceivable productiveness in its own science so great a power for quite different affairs. We may also obtain additional points of comparison, which may place both aspects of DeCandolle's character in a peculiar light. This warm devotion to his republican country, this self-sacrificing attachment to its interests, is a trait in which he resembles the sages and philosophers of classic antiquity. As Aristotle found time, in the

midst of his numerous works on physics, natural history and philosophy, to write others on politics; as nearly all the Grecian philosophers, in addition to their widely different pursuits, were also practical or theoretical statesmen, so we find the citizen of the small Swiss canton penetrated with ideas and feelings which belong to him only as a citizen of this inconsiderable spot of earth; he, the same man whose writings, composed in either the Latin or French language, are read from the Ganges to the Mississippi. We cannot escape the thought, that so active a devotion to the interests of the community could only exist in the mind of a learned man in whom the ancient associations of republicanism have not given place to the modern spirit,—the spirit of monarchical centralization. This old classical mode of thinking showed itself in many other great Swiss scholars, in Conrad Gessner, Alb. von Haller, Saussure, &c., as well as in DeCandolle, though not in an equal degree; for however attached from inward conviction to the form of government of their country, not one of them had so earnest a desire to take an active part in the internal affairs of the republic. They were all rather theoretical students; while in DeCandolle was reflected the spirit of our age, which passes onward from theory, from pure science, into realization in the form of useful ideas. The thought of the dignity and perfectibility of man, which the French Revolution had so often in its mouth, only to degrade, shone out in the noble-minded, ardent citizen of Geneva,—a son of the Revolution in the highest sense of the word.

A comparison of Linnæus with DeCandolle in this point of view, will result greatly in favour of the latter. We see Linnæus in Upsal, a remote and inconsiderable university-town of the North, active in the professor's chair, where he is surrounded by a crowd of young men eager for knowledge from almost every part of the earth; or we see him at the writing-table of a small room, from which the dictator of natural history sends throughout the world his works, written in that terse, genial Latin in which his whole self is mirrored. There only lives Linnæus; or in *aula academica*, presiding over the discussions of his scholars; or in the small primitive botanical garden, where the registrator of the vegetable kingdom walks between formal rows of box and regular flower-beds in silent meditation. The northern natural historian withdrew himself from the world; he did not even deign to take part in the administration of the academic senate, which he regarded only as a burden. Restricting his society to a few friends, and to the unfrequent visitors from other countries, Linnæus looked not upon the bustle of the world, except sometimes to deprecate it; only in the concrete study of nature does he find himself at ease. He is no cosmopolite, except that he studies na-

ture in every zone; he recommends Swedish medicinal and esculent plants instead of those which distant countries might offer. His mind becomes a denizen of every corner of the earth, but he belongs personally to Sweden alone. He allowed all political commotions to pass by him unheeded while absorbed in the contemplation of nature; chained to his little inkstand, from which he scattered through the world, with luminous, aphoristic geniality, his thoughts, his anticipations of higher wisdom,—almost always expressed in the language of Scripture, and with an emphatic unction.

How entirely different was DeCandolle! He is the man of the council, the man of the people. His power was felt as well in the Genevan republic as in the republic of letters. No movement in the political world is to him a matter of indifference. He notices every change, and marks its relations to the progress of science. If he open his lecture-room, it is not merely active young men who sit attentive at his feet: the *élite* of the fashionable world and of the higher walks are among his auditors; men and women of his own city, and numerous travellers from distant lands, who, between Paris and Rome, crowd the highway of European travel, passing through Geneva, all felicitate themselves upon having listened to his eloquent discourses. Whilst the northern student of nature meditates in solitude by the light of his study-lamp, the pride of the learned world of Geneva, in his saloon, surrounded by the comforts of a half-English, half-French establishment, receives the visits of rich or celebrated friends and of his fellow-citizens, who talk of the movements of the political world, consult with him on the interests of their country, or listen to the voice of some enlightened citizen of the world, with lively interest in his far-reaching plans.

Thus are portrayed, in the persons of Linnæus and of DeCandolle, not merely the state of the natural sciences, but also the more universal features of the spirit of their respective æras, as exhibited in the school and in life.

But in order to complete the portrait of our departed friend, I must now give a more particular account of those literary works which he commenced soon after his return to Geneva, when his mind had attained its full maturity; those works which especially authorize us to term him the Linnæus of our time; I mean his universal system of plants (an undertaking which was the result of the observations of many years of repeated visits to the great collections of plants in Paris and London*, and of a diligent correspondence with all the considerable botanists of the world), which he began to publish in the year 1818, and continued to labour

* In 1816 M. DeCandolle visited Sir J. E. Smith at Norwich, where the Linnæan Collection then was.—Ed.

upon with unexampled diligence until the end of his days. Since the death of Willdenow (in the year 1810) and the publication of the 'Enchiridion Botanicon' of Persoon in 1809, botanical literature comprised no work which presented a universal view of all known plants according to their genera and species. The new edition of the 'Systema Vegetabilium' of Römer and Schultes made but little progress after the death of the former. The systematic knowledge of plants remained in a fluctuating state. Whilst numerous monographs appeared, and the materials were multiplied by discoveries in all the countries of the earth, there was no clue to guide in the labyrinth of countless forms. At the same time, the necessity was constantly more and more felt of arranging plants, not in the dead framework of the Linnæan sexual system, but according to the so-called natural families in a comprehensive scientific whole. If we are not even yet able to conceive of these original types, as so many foci of the moving and forming spirit pervading the vegetable world, expressed in each individual case by more or less striking external characters; if we are obliged in the first instance to adhere to collective characters, that is, to the admission of a certain sum of distinctive marks; if it must further be acknowledged, that although we can perceive the principal characteristics, as they exhibit themselves in a few families, yet that we lose them entirely in their *organic*, that is, in their *universal* connexion—in their evolution, as it were, out of each other; if especially we cannot deny that the natural method does not yet bring with it any philosophic satisfaction; that above all, the inward truth does not harmonize perfectly with *any* system,—it must however be acknowledged, that we can in no other way attain to an understanding of the kingdom of plants as a great whole, than by the path of a thoroughly concrete examination, led by the hand of analogy and induction. The German students of nature acknowledge that such an understanding cannot be obtained by speculation, nor by any constructive method; and they can only promise themselves favourable results by pursuing the path opened by Jussieu's 'Méthode Naturelle.' In other countries also—for example, in France and England, more recently in Italy likewise—Jussieu's doctrines had already struck powerful roots; and thus was the age expecting and prepared for a work which should extend the applications of the "natural system," carrying it on from the *genera* in which its founder had represented it, to the *species*, and giving by means of it a full and satisfactory description of the latter.

In order to have a due conception of the vastness of this undertaking and its enormous difficulties, it is necessary that we should glance at the progress of descriptive botany. This part of the science, which so many regard as a lifeless register, others as

the whole sum of botanical knowledge, dates no further back, in a systematic form, than the sixteenth century. In 1584 Conrad Gessner published the first methodized work upon the vegetable kingdom. In 1623 Caspar Bauhin produced the first systematic register ('Pinax'), in which about seven thousand species of plants were indicated by names and some description, but without characteristics. Tournefort published the first work which can be properly called a systematic arrangement, in the years 1694 and 1700. His work contains 9516 articles, or about 8000 species of plants; and this number was not materially increased in the next succeeding general work, the 'Historia Plantarum' of Ray, in the years 1693 to 1704. In 1737 Linnæus gave his first systematic description of known plants. As Tournefort had introduced the conception of *genera* into science, that of *species* was now established, along with a method of description based on a well-founded and enlarged terminology. But Linnæus, in throwing overboard a vast number of old and unintelligible accounts of plants as useless ballast, at once reduced the list of species to about 7000, a number which in the later editions of his 'Systema' may have been increased to about 12,000. Since that time the increase of acknowledged species has been truly prodigious. In the last of the works of Linnæus, in the year 1760, we find in the first five classes of his sexual system 1835 species of plants; Vitman in 1790 has 3491; Willdenow in 1797, 4831; Persoon in 1806, 6121; Römer and Schultes from 1817 to 1823, 13,519 species. In the first edition of Steudel's 'Nomenclator Botanicus,' the first complete 'Pinax' since Bauhin, the number of genera of Phænogamous plants, or of the first twenty-three classes of the Linnæan system, amounts to 3376, and that of species to 39,684: the second edition of this celebrated work, on the other hand, which was finished in the current year 1841, reckons of Phænogamous plants, 6722 genera and 78,005 species.

DeCandolle's task was therefore six times greater than that of Linnæus, if we only take simple numbers into consideration. But to this must be added the numerous difficulties which arise from the dispersion of materials throughout a literature in which the botanists of all civilized countries take part. Besides, in the time of Linnæus, science had much fewer foci than at present. Learned societies have now been formed in North and South America, in India and Java, for the promotion of the natural sciences, and separate portions of systematic botany are treated in periodical publications, monographies, and greater or smaller works, written, not in Latin exclusively, as was formerly the case, but often in the language of the country. Hence the acquisition of the requisite literary apparatus merely is now within the reach of only very considerable pecuniary means. DeCandolle, with the most

noble disinterestedness, sacrificed in this cause a great portion of his estate.

Equally formidable are the internal obstacles attendant upon the examination of vast collections of plants. The characteristics of the genera according to the natural method are made to rest upon organic peculiarities, which scarcely required a notice in the Linnæan system; such for example as the internal structure of the ovary, the ovule, and the seeds. The use of the microscope, neglected by Linnæus, is now become quite indispensable. The distinguishing marks of species are founded on numerous and often very minute differences, which require a close examination of all the parts. To make out a diagnosis, the description must now be more circumstantial than formerly, when a few words were sufficient to discriminate between related species. Linnæus's 'Systema Plantarum,' in the Reichardt edition of 1779, describes seven species of the genus *Eugenia,* and only thirteen of *Myrtus.* DeCandolle, in the year 1828, has 194 of the former genus and 145 of the latter, of which he forms two divisions. It is obvious to every one that this immense increase of the labour of the systematic describer must weigh heavily upon each separate species. To this must be added, finally, the necessity of regarding each plant no longer merely as a prepared, or, as it were, crystallized production of nature, as was done by Linnæus, but as a living and acting self-developing being; a view which has been elicited by the doctrines of morphology, and which cannot now be wholly excluded from merely descriptive treatises.

DeCandolle began his great work in the year 1818, in an extended form, under the title of 'Regni Vegetabilis Systema Naturale.' Two volumes had already appeared, when he perceived that so immense a field laughed to scorn the limits of human life; he therefore adopted a condensed form, and published seven volumes between the years 1824 and 1838. With an enthusiasm which has perhaps never inspired any other botanist, he devoted the greater part of the day to this gigantic task. Still he was not able to go through the whole extent of the vegetable kingdom in this manner. The work was interrupted by his death in the middle of the eighth volume; and a great portion of the so-called *Monopetalous plants,* as well as the classes of *Monocotyledones* and *Acotyledones,* are yet untouched.

DeCandolle appears peculiarly great in the accurate comprehension of the characters both of genera and species. In the description of distinctive marks, he not unfrequently departs from the terminology of the Linnæan school. Whilst he at times describes a given object with admirable art, conveying the most lively image to the mind, his expressions occasionally fail of this distinctness. No one who can realize the greatness of the task

will be surprised, that amidst such an overwhelming mass of materials, some objects should be described after a less thorough examination and scrutiny. But we never fail to recognise the intelligent, penetrating systematizer, furnished with the happiest talent for combination, even when not altogether fortunate or thorough in his observation of the particular subject. Well has the greatest English botanist said of him—*his head is still better than his eye.*

DeCandolle has given a fuller development of his morphological and systematic views respecting particular families of plants and genera, in a series of treatises which have been regarded as models of monographical labour by all systematic botanists*. It should be particularly mentioned here, that he enriched the geography of plants, elevated by Alex. von Humboldt to the dignity of a peculiar science, with many important facts, and exhibited also the practical aspect of this study. His general views on this subject are laid down in a valuable "Essai Elémentaire de Géographie Botanique," published in the 18th part of the 'Dictionnaire des Sciences Naturelles.'

I pass over many of the minor scientific labours of this unweariedly active man, such as his systematic account of the species of Cabbage, his description of remarkable plants of the Genevan botanical garden, and numerous contributions to the memoirs of various scientific associations, who vied with each other in thus appropriating the activity of this admirable man. More than a hundred diplomas from learned societies in every part of the civilized world testify his scientific eminence and the extension of his literary relations. Since 1808 he has belonged to the Royal Bavarian Academy of Sciences; since 1822 to the Royal Society of London. In the year 1826 he was chosen one of the eight *associés étrangers* of the Royal Academy of Sciences at Paris; and King Louis Philippe has testified his respect for the learned Genevan by bestowing upon him the cross of the Legion of Honour.

These various marks of respect could not dazzle a man, who, in the most animated intercourse with science and with mankind, perceived the endlessness of the subjects of inquiry, and who exaggerated neither the measure of his own limited powers nor the amount of his influence. Like all truly great men, DeCandolle was modest; and the consciousness of his own worth is shown only in the lenity with which he judged others, and in the heartiness with which he applauded their services. His twofold enthusiasm to increase the knowledge and advance the welfare of the human race, reposed on a gentle but uncompromising character.

* Mémoires sur la famille des Legumineuses, Par. 1825, 4to. Collection de Mémoires pour servir à l'Histoire du Règne Végétal. Par. 1828—1838. (10 Mem.)

From temperament he was impetuous, rapid in determination, firm and unfaltering in execution; he had the practical skill to carry his plans into effect in every variety of occupation. A practised physiognomist would detect these characteristics at a glance. DeCandolle was of a sanguine temperament, of middle stature, firm, broad-chested, with proportionably long and muscular arms, quick and elastic in his walk, light and brisk in all his movements. His oval face, shaded by thick black hair, and by its somewhat dark complexion reminding one of his Provençal origin, was not so much distinguished by the expression of a well-marked and prominent profile, as by the high and finely arched brow, the mobility of the features, the fire of his brown, proportionably small eyes, which shone even through spectacles, and by the charm of his mouth. In speaking, the whole intellectual expression of the man was suddenly elevated. His ideas unfolded themselves easily and without effort in discourse, which, like his writings, inclined rather to rhetorical breadth than to exact conciseness.

The poetical element of his mind, which he manifested while yet a scholar in the college, remained active in him in later years. His fancy, both strong and rich, variously coloured, blooming, and rapid in its movements, clothed his quick-rising conceptions in a light and graceful dress. He has left behind a great number of poems of a lyrical character, in which he represents the universal feelings of nature, or unfolds with grace and delicacy the emotions of the human heart. What we have seen of these reminds us of Lafontaine, Delille, and of our own Pfeffel. From 1821 to his death, he continued his autobiography with great particularity, in which are contained valuable materials for moral and literary history, often under the form of explanatory notes. His son will publish, with such omissions as circumstances require, this memorial of the untiring activity of this excellent man.

But while such variously directed labour found in itself the best intellectual reward, DeCandolle was by degrees obliged to acknowledge the insufficiency of his physical powers for the task he had himself allotted to them. In the year 1825 he had the misfortune to lose his youngest son, a promising boy of thirteen years old. The philosopher sought to soften the sorrows of his heart by increased activity, and redoubled his zeal for the completion of his work; but from that time his health began to fail. He often suffered from attacks of gout, and from obstinate catarrhal affections, and was obliged on that account to relinquish his professorship in 1834, which was transferred by the Senate to his son Alphonse. In the year 1835 he suffered from a severe illness. He was afflicted with an asthma and a disease of the throat [bronchocele?], for which excessive doses of iodine were prescribed. In consequence of this he suffered from *œdema pedum* and from nervous

attacks, which increased until his death. He was never perfectly well after 1835, and his strength was so much exhausted that the progress of the dropsy, which from the month of June rapidly increased, could no longer be opposed with effect. He died at six o'clock in the evening of the 9th of September [1841], having lost his consciousness several hours earlier.

By his will of the 20th of February of the present year [1841] he left his library and his collection of plants to his son, with the condition that they should be open, as before, to the inspection of botanists, as if in a public establishment, and that students should have the use of them until the end of their term of study. The filial devotion of the son has made the fulfilment of these conditions a sacred duty. Many distinguished botanists have promised their aid for the completion of a work which transcends the powers of any individual. DeCandolle bequeathed to the Society of Natural History of Geneva the sum of 2400 francs, the interest of which is to be distributed in prizes for botanical monographs. The right of publishing new editions of his 'Théorie Elémentaire' and of his 'Organographie,' he left to his friend and scholar Guillemin* in Paris; the same right with regard to the 'Flore Française' and the 'Essai sur les Propriétés Médicales des Plantes,' he bequeathed to Prof. Dunal in Montpelier.

This is the image, in its essential features, of one of the most excellent men which the century has presented to receive the honours of science. In botany, that Candollea, the Australian shrub to which Labillardière has affixed his name, is not required to keep him fresh in the memory of his botanical associates: he has inscribed his own name on every page of the system of plants. Neither does posterity require the monument which his native city proposes to erect to his memory, nor the new "*Rue DeCandolle*" next to the botanical garden in Rochelle, in order to say how great has been the influence of DeCandolle in our time. *Exegit monumentum ære perennius.*

II.—*Observations on some Points in the Anatomy and Physiology of the Freshwater Algæ.* By Arthur Hill Hassall, Esq.

[With a Plate.]

On Cytoblasts in the Algæ.—From the high development of the cells of many Algæ, both marine and freshwater, as well as from their extreme transparency in many species, it might have been supposed that the first discovery of those curious organs termed

* [This favourite pupil did not live even to commence the undertaking thus committed to his charge: he died early in the spring of 1842.—A. G.]